

Engineering Design File

Operable Unit 1-07B Sample Results Summary for 40 CFR 264 Appendix IX Volatile and Semivolatile Organic Compounds

ENGINEERING DESIGN FILE

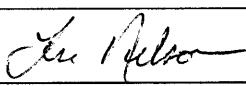
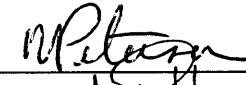

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4. Title: OU1-07B Sample Results Summary for 40 CFR 264 Appendix IX Volatile and Semivolatile Organic Compounds

5. Summary: In situ bioremediation (ISB) is the new proposed remedy for the contaminated groundwater plume at Test Area North. This remedy is effective at degrading trichloroethene, tetrachloroethene, dichloroethene, and vinyl chloride into the harmless byproducts ethene, ethane, chloride, carbon dioxide, and water. There is a concern that ISB also will release contaminants that will pose a health risk from the source material into the groundwater. The purposes of this Engineering Design File are to describe the results of sampling and analysis of selected groundwater monitoring wells to detect volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) not previously identified and to determine if any of them pose a health risk. Based on the results, none of the wells sampled had a hazard index greater than one and ISB does not release any additional VOCs or SVOCs from the source material that will pose a health risk.

6. Distribution (complete package):
Distribution (summary package only):

7. Review (R) and Approval (A) Signatures: (Minimum reviews and approvals are listed. Additional reviews/approvals may be added as necessary.)

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ACRONYMS

c-DCE	cis-1,2 Dichloroethene
t-DCE	trans-1,2 Dichloroethene
EPA	U.S. Environmental Protection Agency
ISB	in situ bioremediation
MCL	maximum contaminant level
PCE	Tetrachloroethene
ppb	parts per billion
SVOC	Semivolatile organic compound
TAN	Test Area North
TCE	Trichloroethene
VOC	volatile organic compound

OU 1-07B Sample Results Summary for 40 CFR 264 Appendix IX Volatile and Semivolatile Organic Compounds

In situ bioremediation (ISB) is the proposed remedy for a contaminated groundwater plume located at Test Area North (TAN). This remedy will be used to reduce the contaminants of concern to below maximum contaminant levels by 2095. Previous sampling and analysis of TAN groundwater monitoring wells detected the presence of volatile organic compounds (VOCs): trichloroethene, tetrachloroethene, trans-1,2-dichloroethene, and cis-1,2-dichloroethene. These four VOCs represent the contaminants of concern for the TAN groundwater cleanup project. The concentration ranges of TAN groundwater contaminants of concern as identified in the 1995 Record of Decision are in Table 1.

The State of Idaho Department of Environmental Quality has requested project personnel to sample and analyze contaminated TAN groundwater to ensure that no additional contaminants of concern have been released to the groundwater as a result of ISB. Additional groundwater samples were collected in January 2000, and analyzed for the 40 CFR 264 Appendix IX VOC and semivolatile organic compound (SVOC) list of analytes. To determine if additional contaminants of concern were present, the cumulative hazard index was calculated for each of the sampled wells. Four wells (TAN-25, TAN-28, TAN-36, and TAN-51) were sampled and analyzed. The analyses were conducted at the Southwest Laboratory of Oklahoma, Inc. per SW-846 protocol. Appendix A is a list of the 40 CFR 264 Appendix IX VOC and SVOC contaminants in Appendix A. Appendix B is a list of the analytical results.

Methylene chloride and chloroform were detected in at least one of the groundwater monitoring samples. These contaminants are found occasionally in both blank water samples and groundwater monitoring samples. Both of these contaminants were screened out during the 1994 remedial investigation/feasibility study process calculations per EPA guidance (Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, 1989). During this process, methylene chloride and chloroform were identified as common laboratory contamination and field blank sample contamination respectively. Because of the identified contamination associated with these two contaminants, they were not included in the hazard index.

Table 2 shows the chemical species that were included in the hazard index calculations for each water sample. The hazard index contribution was calculated using Environmental Protection Agency (EPA) Region 9 guidance.

Table 1. Concentration ranges of contaminants of concern in TAN groundwater as identified in the 1995 Record of Decision.^a

Volatile Organic Compound	Ranges of Contaminant Concentrations parts per billion (ppb)
Trichloroethene (TCE)	12,000 – 32,000 ppb
cis-1,2 Dichloroethene (DCE)	3,200 – 7,500 ppb
trans-1,2-Dichloroethene (DCE)	1,300 – 3,900 ppb
Tetrachloroethene (PCE)	110 ppb

a. The groundwater samples were taken from the TSF-05 injection well.

Table 3 shows the cumulative hazard index calculated for each water sample. The hazard index is less than one for all of the wells. The cumulative hazard index calculated for samples that were collected from the groundwater monitoring wells is nearly as low as the hazard index calculated for the blank sample. Hence, no VOCs or SVOCs other than those listed in Table 1 pose a health risk or are released from the source material as a result of ISB.

Table 2. VOC and SVOC analytes detected in selected TAN groundwater monitoring wells that were included in the hazard index calculation.

Groundwater Monitoring Well	Analyte	Concentration (µg/L)	Data Quality Flag ^a	Hazard Index Contribution
TAN-25	Phenol	8.5	*, J	3.9E-5
TAN-25	4-Methylphenol	495	*	0.27
TAN-25	Bis(2-Ethylhexyl)phthalate	3	J, B	0.06
TAN-28	Bis(2-Ethylhexyl)phthalate	2	J, B	0.04
TAN-51	1,4 Dichlorobenzene	1	J	0.20
QC Blank	Bis(2-ethylhexyl)phthalate	5	J, B	0.10

a. The analytical laboratory reported the data quality flags as follows: '*' meant that the results were averaged from dilutions, 'J' represented an estimated value, and 'B' was used when the analyte was found in the associated blank as well as in the sample.

Table 3. Cumulative hazard index for selected TAN groundwater monitoring well samples and the quality control blank sample.

TAN Groundwater Monitoring Well	Cumulative Hazard Index ^a	Hazard Index Contributors
TAN-25	0.33	4-Methylphenol and Phenol
TAN-28	0.04	Bis(2-Ethylhexyl)phthalate
TAN-36	0	None
TAN-51	0.20	Dichlorobenzene
Quality Control Blank	0.10	Bis(2-Ethylhexyl)phthalate

a. Hazard index was calculated using EPA Region 9 guidance.

Appendix A

40 CFR 264 Appendix IX VOC and SVOC Analyte List

Table A-1. 40 CFR 264 Appendix IX VOC Analyte List.

Dichlorodifluoromethane	Acrylonitrile
Methyl Chloride	Allyl chloride
Vinyl Chloride	Chloroprene
Bromomethane	Isobutyl Alcohol
Chloroethane	Methacrylonitrile
Trichlorofluoromethane	Propionitrile
1,1-Dichloroethene	trans-1,4-Dichloro-2-butene
Acetone	Ethyl methacrylate ^a
Carbon Disulfide	Methyl methacrylate ^a
Methylene Chloride	Pentachloroethane ^a
Trans-1,2-Dichloroethene	1,2-Dibromo-3-chloropropane
Methyl Iodide	Chlorobenzene
1,1-Dichloroethane	1,1,1,2-Tetrachloroethane
Cis-1,2-Dichloroethene	Ethylbenzene
2-Butanone	m,p-Xylenes
Chloroform	o-Xylene
1,1,1-Trichloroethane	Styrene
Carbon Tetrachloride	Bromoform
Vinyl Acetate	1,1,2,2-Tetrachloroethane
Benzene	1,2,3-Trichloropropane
1,2-Dichloroethane	Acetonitrile
Trichloroethene	Acrolein
1,2-Dichloropropane	
1,4-Dioxane	
Dibromomethane	
Bromodichloromethane	
Cis-1,3-Dichloropropene	
4-Methyl-2-Pentanone	
Toluene	
Trans-1,3-Dichloropropene	
1,1,2-Trichloroethane	
1,2-Dibromoethane	
Tetrachloroethene	
2-Hexanone	
Dibromochloromethane	

a. Analyzed and reported as volatiles, but listed as semivolatilities in ER-SOW-169.

Table A-2. 40 CFR 264 Appendix IX SVOC Analyte List.

Aniline	3-Nitroaniline	Dibenz(a,h)anthracene
Phenol	Acenaphthene	Benzo(g,h,i)perylene
Bis(2-Chloroethyl)ether	2,4-Dinitrophenol	7,12-Dimethylbenz(a)anthracene
2-Chlorophenol	4-Nitrophenol	3-Methylchloranthrene
1,3-Dichlorobenzene	Dibenzofuran	Hexachlorophene
1,4-Dichlorobenzene	Hexachloropropene	2,4-Dinitrotoluene
Benzyl alcohol	Pentachlorobenzene	2-Naphthylamine
1,2-Dichlorobenzene	2,3,4,6-Tetrachlorophenol	
Bis(2-Chloroisopropyl)ether	Diethylphthalate	
2-Methylphenol	4-Chlorophenyl-phenylether	
Hexachloroethane	Fluorene	
Pyridine	4-Nitroaniline	
N-Nitrosodimethylamine	Safrole	
2-Picoline	1,4-Naphthoquinone	
n-Nitrosomethylethylamine	1,3-Dinitrobenzene	
Methyl methanesulfonate	2,6-Dinitrotoluene	
n-Nitrosodiethylamine	1-Naphthylamine	
Ethyl methanesulfonate	2-Methyl-5-nitroaniline	
Acetophenone	Thionazin	
n-Nitrosopyrrolidine	Diphenylamine	
n-Nitrosomorpholine	4,6-Dinitro-2-methylphenol	
n-Nitroso-di-n-propylamine	4-Bromophenyl-phenylether	
o-Toluidine	Hexachlorobenzene	
3-Methylphenol	Phenanthrene	
4-Methylphenol	Anthracene	
2-Nitrophenol	2-sec-butyl-4,6-Dinitrophenol	
2,4-Dimethylphenol	Di-n-butylphthalate	
Bis(2-Chloroethoxy)methane	Fluoranthene	
2,4-Dichlorophenol	Pentachlorophenol	
1,2,4-Trichlorobenzene	N-Nitrosodiphenylamine	
Naphthalene	Phenacetin	
2,6-Dichlorophenol	4-Aminobiphenyl	
4-Chloroaniline	Pentachloronitrobenzene	
Hexachlorobutadiene	Pronamide	
4-Chloro-3-methylphenol	Methapyrilene	

Table A-2. (continued).

2-Methylnaphthalene	4-Nitroquinoline-1-oxide
1,2,4,5-Tetrachlorobenzene	1,3,5-Trinitrobenzene
Nitrobenzene	Pyrene
n-Nitrosopiperidine	Butylbenzylphthalate
Isophorone	Benzo(a)anthracene
o,o,o-Triethylphosphorothioate	Chrysene
n-Nitrosodibutylamine	bis(2-Ethylhexyl)phthalate
Isosafrole	Aramite
a,a-Dimethylphenethylamine	Methyl Yellow
Benzoic acid	3,3-Dimethylbenzidine
p-Phenylenediamine	2-Acetylaminofluorene
Hexachlorocyclopentadiene	3,3-Dichlorobenzidine
2,4,6-Trichlorophenol	Famphur
2,4,5-Trichlorophenol	Di-n-octylphthalate
2-Chloronaphthalene	Benzo(b)fluoranthene
2-Nitroaniline	Benzo(k)fluoranthene
Dimethylphthalate	Benzo(a)pyrene
Acenaphthylene	Indeno(1,2,3-cd)pyrene

Appendix B

Appendix IX VOC and SVOC Results

Table B-1. 40 CFR 264 Appendix IX VOC and SVOC Results.

Well	Analysis	Compounds Detected	Concentration (µg/L)	Data Qualities
TAN-25	Appendix IX VOC	Methylene Chloride	13 ^a	
TAN-25	Appendix IX VOC	Hexane	11 ^a	JN, TIC
TAN-25	Appendix IX SVOC	Phenol	8.5 ^a	J
TAN-25	Appendix IX SVOC	4-Methylphenol	495 ^a	
TAN-25	Appendix IX SVOC	Benzoic Acid	37 ^a	J
TAN-25	Appendix IX SVOC	bis(2-Ethylhexyl)phthalate	3	JB
TAN-25	Appendix IX SVOC	Propanoic Acid	273 ^a	JN, TIC
TAN-25	Appendix IX SVOC	Butanoic Acid	300 ^a	JN, TIC
TAN-25	Appendix IX SVOC	2-Methyl Butanoic Acid	320	J, TIC
TAN-25	Appendix IX SVOC	3-Methyl Butanoic Acid	92	JN, TIC
TAN-25	Appendix IX SVOC	Pentanoic Acid	530 ^a	JN, TIC
TAN-25	Appendix IX SVOC	2-Methyl-Hexanoic Acid	260	JN, TIC
TAN-25	Appendix IX SVOC	4-Methyl-Pentanoic Acid	36	JN, TIC
TAN-25	Appendix IX SVOC	Hexanoic Acid	89	JN, TIC
TAN-25	Appendix IX SVOC	4-Methyl-Hexanoic Acid	26	JN, TIC
TAN-25	Appendix IX SVOC	Heptanoic Acid	140	JN, TIC
TAN-25	Appendix IX SVOC	Octanoic Acid	30 ^a	JN, TIC
TAN-25	Appendix IX SVOC	Benzenacetic Acid	215 ^a	JN, TIC
TAN-25	Appendix IX SVOC	Nonanoic Acid	27 ^a	JN, TIC
TAN-25	Appendix IX SVOC	1,3-Dihydro-2H-Indol-2-one (CAS # 59-48-3)	16	JN, TIC
TAN-28	Appendix IX VOC	Methylene Chloride	43	
TAN-28	Appendix IX VOC	Chloroform	8	J
TAN-28	Appendix IX VOC	Hexane	38	JN, TIC
TAN-28	Appendix IX VOC	Cyclotrisiloxane	90	J, TIC
TAN-28	Appendix IX VOC	Cyclotetrasiloxane	100	J, TIC
TAN-28	Appendix IX SVOC	bis(2-Ethylhexyl)phthalate	2	JB
TAN-28	Appendix IX SVOC	Cyclohexane, 1-methyl-2-prop (CAS # 4291-79-6)	6	JN, TIC
TAN-36	Appendix IX VOC	None		
TAN-51	Appendix IX VOC	Methylene Chloride	8 ^b	
TAN-51	Appendix IX SVOC	1,4 Dichlorobenzene	1	J
QC blank	Appendix IX VOC	Methylene Chloride	9 ^b	
QC blank	Appendix IX VOC	Hexane	8	JN, TIC
QC blank	Appendix IX SVOC	bis(2-Ethylhexyl)phthalate	5	JB
QC blank	Appendix IX SVOC	N,N-Dimethyl-Formamide	11	JN, TIC

a. averaged from dilutions

b. average from duplicates

J Indicates an estimated value.

N Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds (TIC), where the identification is based on a mass spectral library search.

B This flag is used when the analyte is found in the associated blank as well as in the sample.